USDA Southwestern Great Plains Research Center at Bushland – 1975

Corn Production Symposium

March 11, 1975

Sponsored by:
The Texas Agricultural Experiment Station
Texas Agricultural Extension Service
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in cooperation with
Texas Corn Growers Association

Supporting the goals of the Panhandle Economic Program

CORN PRODUCTION SYMPOSIUM

March 11, 1975

SOUTHWESTERN GREAT PLAINS RESEARCH CENTER
Bushland, Texas

PROGRAM

<u>1ST SESSION</u>	Presiding - Dr. Kenneth B. Porter, Professor Texas Agricultural Experiment Station	
1:15-1:25	WELCOME AND INTRODUCTIONS Dr. Paul Unger, Acting Research Leader Soil Scientist, USDA	
1:25-1:35	TAES CORN RESEARCH - HIGH PLAINS Dr. Kenneth Porter, Professor Texas Agricultural Experiment Station	
1:35-1:55	CORN PRODUCTION AND HYBRID SELECTION Dr. Frank Petr, Area Agronomist Texas Agricultural Extension Service	
1:55-2:15	CULTURAL PRACTICES IN CORN PRODUCTION Dr. Steven Winter, Assistant Professor Texas Agricultural Experiment Station	
2:15-2:35	IRRIGATED CORN PRODUCTION Dr. John Shipley, Associate Professor Texas Agricultural Experiment Station	
2:35-2:50	BREAK	
<u>2ND SESSION</u>	Presiding - Mr. Paul Gross, District Agent Texas Agricultural Extension Service	
2:50-3:10	WEEDING CORN Dr. Allen F. Wiese, Professor Texas Agricultural Experiment Station	
3:10-3:30	SOUTHWESTERN CORN BORER AND BANKS GRASS MITE Mr. Norris Daniels, Associate Professor Texas Agricultural Experiment Station	
3:30-3:50	CORN INSECT PROBLEMS - MANAGEMENT AND CONTROL Dr. Bill Clymer, Area Entomologist Texas Agricultural Extension Service	
3:50---	QUESTIONS AND ANSWERS	

CORN IMPROVEMENT PROGRAM FOR THE HIGH PLAINS

Anton J. Buckholt*

The corn improvement program of the Texas Agricultural Experiment Station has far-reaching significance. It is the only publicly supported program in the Southwest. Corn hybrids developed in this program are adapted for production in areas with a relatively low humidity and where hot, dry winds are common. Texas hybrids presently are being grown throughout the Southwest and in a number of foreign countries such as Mexico, Egypt, Syria, Israel, Iraq and India.

Emphasis in the breeding program is on the development of hybrids with improved standability and insect and disease resistance. It wasn't until 1968 that any real effort was made to develop a hybrid for the High Plains. However, since then experimental hybrids have been tested annually at one or more of the following locations: Lubbock, Muleshoe, Bushland, Dimmitt, and Etter.

Hybrids adapted to the High Plains generally are distinctly different from those adapted to other parts of Texas. Characteristically the hybrids best adapted are single-crosses which are relatively early and can withstand high plant populations.

Excellent yielding hybrids are available for this area, however, most of the hybrids are extremely susceptible to the Southwestern corn borer and many are susceptible to corn smut. I believe that it is in these areas that the Texas corn program can be of the most benefit to the economy of the High Plains.

*Associate Professor, Department of Soil and Crop Sciences, Texas A&M University.

Corn Production and Hybrid Selection

Frank C. Petr

Corn has been grown to a limited extent in the High Plains of Texas since the early 1900's. Under dryland conditions farmers found that grain sorghum was better adapted to the occasional high temperatures and long periods of severe moisture stress. With the development of irrigation a moderate acreage of corn was grown. By 1963 the acreage was down to about 34,000 acres. This was due to the rapid acceptance of hybrid sorghum and to the buildup of the southwestern corn borer.

In the mid 1960's the feedlot industry was gaining momentum and corn acreage began increasing. Much of the corn acreage was planted in the proximity of feedlots and harvested for silage, used as the roughage component of concentrated feed rations. Hauling costs limited silage production to cropland in the immediate vicinity of feedlots, and alfalfa hay was gaining favor as a roughage in feedlot rations. By 1970 corn became an important feed grain cash crop in the High Plains area, and occupied more acreage than corn grown for silage.

In 1973 approximately 750,000 acres of corn was planted in Texas including about 100,000 diverted to silage. In PEP area consisting of 25 counties, approximately 375,600 acres were planted in 1973 which included 69,200 used for silage. The following tables provide more detailed information on the distribution of corn in the state:

1973 Texas Corn Acreage*

Area	Acres	% of Total
Northern High Plains (PEP)	375,600	50.1
Southern High Plains (SPDP)	77,800	10.4
Remainder of Texas	306,600	39.5
Texas (total)	750,000	100.0

1973 Texas Corn Yields*

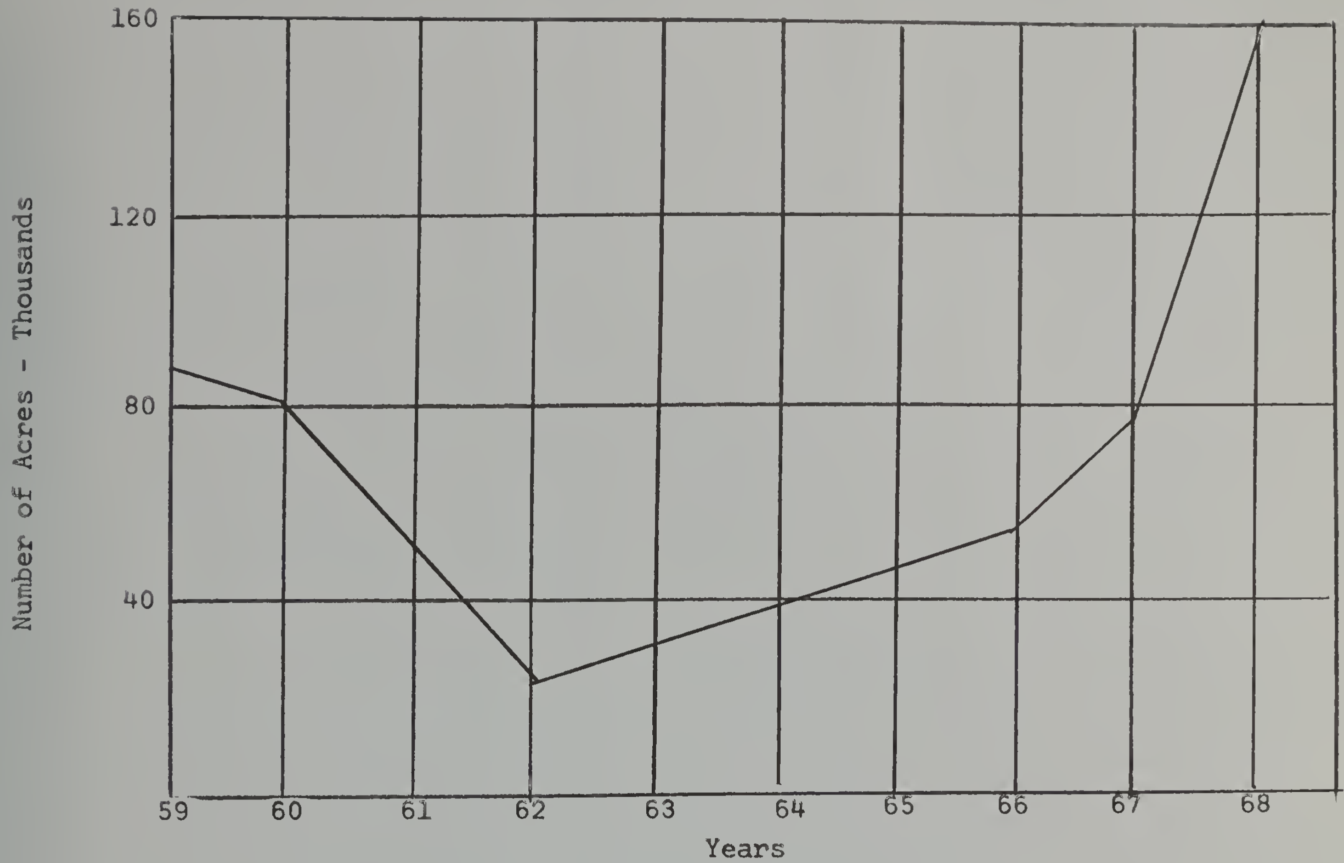
Area	Yield/Acre Grain	Yield/Acre Silage	% Planted Acreage Not Harvested
	bushels	tons	
Northern High Plains	130.2	17.9	0.9
Southern High Plains	124.1	17.3	1.4
Remainder of Texas	46.2	12.7	4.6
Texas	95.0	17.0	1.9

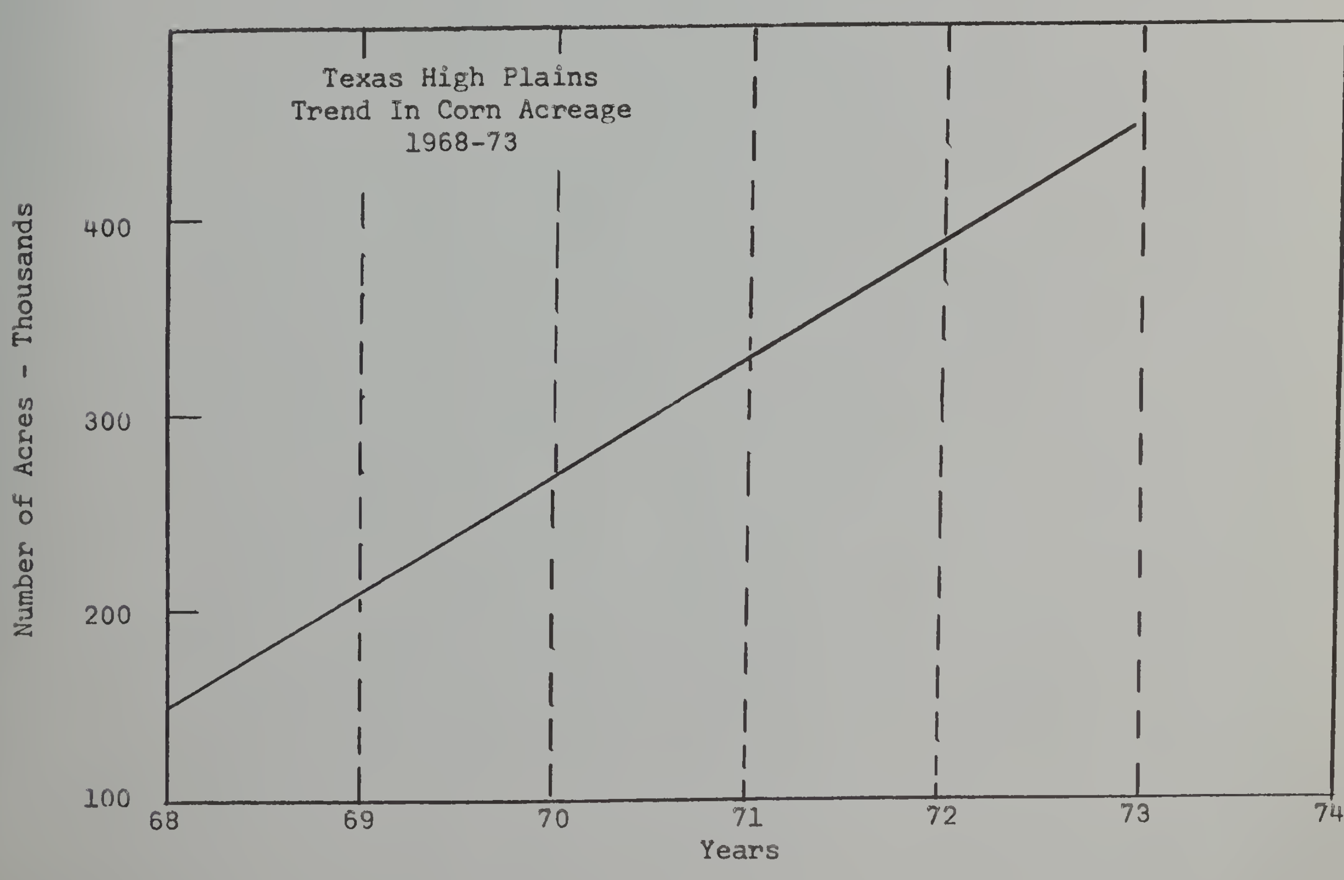
1973 Texas Corn Grain and Silage Production*

Area	Grain		Silage	
	Bushels	% of Texas Production	Tons	% of Texas Production
Northern High Plains	39,482,620	66.3	1,241,540	81.6
Southern High Plains	7,981,450	13.4	214,040	14.1
Remainder of Texas	12,094,520	20.3	64,640	4.3
Total	59,558,590	100.0	1,520,220	100.0

*Source: Calculated from 1973 Texas County Statistics, Texas Department of Agriculture.

Texas High Plains
Trend In Corn Acreage
1959-68





Corn is well adapted to the area and is grown successfully on the fine textured Pullman soils as well as the coarser textured soils in the northwestern part of the Panhandle. Due to erratic rainfall corn is not suited to dryland production in the more arid areas. For best results irrigation should be available throughout the growing season.

A moist firm seedbed is needed for good germination and uniform stands. Before the advent of herbicides part of the tillage in seedbed preparation was done to eliminate weeds, sprouting or growing prior to planting time, thus giving the crop a better competitive advantage. Now under some conditions it is advantageous to leave crop residue undisturbed to provide shade and wind protection for the corn seedlings and prevent wind and water erosion of the soil.

To obtain maximum corn production a high level of fertility is needed. A soil test is the best means to determine the level of nutrients already in the soil. This information should be used as a basis to determine the kinds and amounts of fertilizers that should be applied for a specific yield goal. Under normal conditions to obtain optimum grain yields approximately 150 pounds of nitrogen are needed by the corn crop. When corn is grown for silage approximately 200 pounds of nitrogen per acre is desirable to maximize vegetative development and dry matter yields. On fine textured loam and clay soils the entire nitrogen requirement can be applied as early as several months before planting without risk of excessive nutrient loss. For corn production on sandy or coarse textured soils about half of the nitrogen requirement and phosphorous, if needed, should be applied at or shortly before planting. The remainder of the nitrogen can be sidedressed about 35 days after emergence. In recent years some producers have successfully applied fertilizers through

irrigation water at intervals during the growing season.

Although phosphorous is essential for growth of the corn plant, it is usually difficult to show a yield response to phosphorous on Pullman soils. If the soil test shows a low to medium level of phosphorous it may be advantageous to apply about 40 pounds of P_2O_5 per acre. This encourages rapid plant development and early maturity. The latter is especially important in avoiding possible losses from the southwestern corn borer.

Hybrid Selection

There are a large number of good commercial corn hybrids available for planting in the High Plains of Texas with wide range of maturity and other important characteristics. There has been a trend toward earlier planting making it possible to grow the mid-late and late hybrids in most of the area. Mid-season to early hybrids are preferred if planting is delayed or in areas where the southwestern corn borer is a major problem.

In selecting a hybrid it is necessary to consider a number of factors such as yield potential, maturity, height of ear, standability, disease resistance, insect resistance plus heat and stress tolerance. Usually the dealer can provide such information based on tests made by the commercial breeder. The Texas Agricultural Experiment Station has been testing a limited number of commercial hybrids throughout the state on a fee basis. In the High Plains area yield tests have been conducted at off-station locations in Bailey, Castro and Swisher counties and at the North Plains Research Field in Moore County. Due to a continual change in hybrids and hybrid designations long term average yields are difficult

to compile. Data from individual tests is summarized annually and the information is available from your County Extension Agent.

Hybrid seed is used almost exclusively in preference to open-pollinated varieties. The main reason for this is to take advantage of hybrid vigor which boosts yields as much as 20 percent. Producing hybrid seed requires controlled pollination, consequently, most of the hybrid seed is produced by commercial companies that have the facilities and expertise to do the job efficiently.

There are several types of corn hybrids marketed. The main differences are in how the parental lines are managed in making the hybrids which can be grouped into five main categories:

1. Single cross
2. Double cross
3. Triple cross
4. Special cross
5. Dwarf

Single cross as the name implies involves the crossing of two parential inbred lines. The hybrid seed is harvested from the rows of the female parent which is either male-sterile or in some cases detasseled mechanically. The seed from single crosses possesses the maximum amount of hybrid vigor and the plants produced are very uniform in height, maturity, and response to the environment. Usually such hybrids do well in specific areas under a high level of management.

Double cross hybrids are essentially the product of crossing the progeny of two single crosses. Some of the potential hybrid vigor is lost, and the plants are generally more variable in height, maturity, and response to insects or diseases. Double cross hybrids are usually more

consistent in production from year to year and also under different conditions during the same season. Because of this wider range of adaptability inherited from four parents, double cross hybrids are perhaps best for average levels of management or for conditions that may be less than optimum during some part of the season.

Triple crosses usually involve crossing the progeny of a single cross to an inbred parental line. Actually the performance of triple cross is theoretically somewhere between that of a single cross and a double cross. It retains more hybrid vigor than a double cross but is somewhat more variable and, consequently, more adaptable than a single cross. There are not many good triple crosses available, but the potential is there.

Special crosses are the result of crossing 3 or 4 usually related lines. They are combined to emphasize a special characteristic such as disease resistance, standability or insect tolerance. Because the parental lines are related the hybrid vigor may be somewhat less than can be obtained from crossing unrelated lines and their potential hybrid vigor is also reduced from that expected in a single cross.

Dwarf hybrids are another type of hybrid available to the producer. These can be either single, double or triple crosses. They are genetically short-statured and usually early maturing with reduced yield potential for full season production. The dwarf hybrids have shorter internodes and shorter leaf blades, consequently, there is less shading of the soil which permits weeds to compete for moisture and nutrients. When dwarf hybrids are used the producer should consider using closer row spacings and higher populations.

Regardless of which type of hybrid is chosen, it is important to use the correct planting plates with proper settings to obtain the optimum plant population suggested by the seed dealer for a specific hybrid.

Cultural Practices in Corn Production

Steven R. Winter

Planting date, row width, and plant population have long been recognized as important factors in corn grain production. Much research has been conducted on these topics in the Corn Belt. However, information from the Corn Belt may not be entirely applicable on the Texas High Plains. This report summarizes studies comparing several planting dates, row widths, and plant populations at the Bushland Research Center.

Methods

The planting date studies were conducted on level borders in 1972 and on graded furrows in 1973 and 1974. Fertilizer was adequate for near maximum yields. All plots were watered for near maximum yields with 6, 7, and 5 seasonal irrigations on each date of planting in 1972, 1973, and 1974 respectively.

The row width and plant population studies reported here were conducted by Dr. Kenneth Porter during 1969-71. The experiments were planted in level basins with two hybrids, four row spacings (40, 30, and 20 inch reported here), and three plant populations each year. Dekalb XL45 was irrigated 3, 4, and 4 times while Texas 40 was irrigated 4, 5, and 4 times in 1969, 1970, and 1971 respectively.

Results and Discussion

Results of the 1972, 1973, and 1974 planting date trials are presented in Table 1, 2, and 3 respectively. Planting after early May tended to

increase lodging, moisture in grain at harvest, and plant height. Grain yield decreased about 1.3 bu/day after May 10. Research in the Corn Belt indicates a similar yield advantage for early planting. Decreased lodging and lower moisture in the grain are also very important advantages of early planting.

When these studies were begun, it was anticipated that the early to mid April plantings would give the highest grain yield provided the stand was good. In 1972, there was no advantage of late March or early April plantings compared to mid April. Later plantings were not included that year due to a lack of space. In 1973, wet weather and record cold temperatures in April (Table 4) delayed planting until April 20. The weather remained cold after April 20 and 18 days were required for emergence; the same as the March 23, 1972 planting when temperatures were above normal. The April 20, 1973 planting did not show a yield advantage over the May 3 planting (Table 2). The spring of 1974 was unusually warm (Table 4). A late March planting would have had entirely adequate temperatures for germination. The earliest 1974 planting was made on April 11; unfortunately, the stand was completely destroyed by rodents. Later plantings (especially April 24) were damaged to some degree by rodents. An additional factor in 1974 was the tremendous influence of planting date on plant size as reflected by plant heights (Table 3). The combination of small plants and thinner stands with early planting may account for the lack of yield response to early planting in 1974.

Table 8 gives an estimate of the percent of years when a poor stand could be expected due to cold weather for a range of planting dates. Planting before April 1 is unnecessarily risky with probably little or no advantage to be gained even if a good stand is attained. With good seed, the proper seeding rate (Table 9) and an adapted variety, planting on April 10 to 20 should be relatively safe with good yield potential. Early planting (April 1-15) should be delayed in those years when soil temperatures are below normal. Nothing is to be gained by planting corn when the soil temperature is below 50°F unless it is so late in the spring (after April 25) that soil temperatures will almost certainly be increasing rapidly within a few days.

Narrow rows (20 to 30 inches) increased corn grain yields 4 to 9 percent compared to 40 inch rows (Table 5). Response is apparently similar to that observed in the Corn Belt where narrow rows are credited with a 5 to 10 percent yield increase. The short Dekalb XL45 and the tall Texas 40 responded similarly to row spacings. Generally speaking, a short variety would be expected to respond slightly more to narrow rows.

Different varieties can have a vastly different response to plant population as demonstrated in Table 6. Plant breeders have found that the highest yielding varieties tend to be those that respond well to high plant density. Thus, most high yielding varieties will respond more like Dekalb XL45 than like Texas 40. Table 7 shows another example of a variety capable of yielding well at high plant densities. While the yields were not significantly different, there was a trend towards higher yields at higher plant populations. This study (1972) received several light hail storms that tended to strip the leaves and generally reduce light interception.

The thicker stands appeared to intercept a larger percent of the light under these conditions.

Table 9 gives an estimate of relative seeding rates for different planting dates. Corn should be seeded thicker for earlier planting because early planted corn will be smaller and stand losses may be greater. Late planted corn should be planted thinner to help reduce lodging.

In summary, corn should be planted before May 10 on the Texas High Plains if high grain yields, minimum lodging, and low grain moisture at harvest are desired. Yields can be increased 5 to 10 percent by planting in narrow rows. Seeding rate should be adjusted for the particular variety being planted and for the planting date.

Table 1. Influence of planting date on the performance of Pioneer 3369A, Bushland, Texas, 1972. 1/

Date Planted	Days to Emerge	% Lodging 9-11-72	Yield bu/A
March 23	18	1	184 a
April 5	10	1	183 a
April 15	10	1	185 a

1/ Planted in 30-inch rows. Data presented is an average of three plant populations.

Table 2. Influence of planting date on the performance of McNair X300, Bushland, Texas, 1973. 1/

Date Planted	Days to Emerge	Height Feet	Harvest 2/ Stand	% Lodging 10-21	% Moisture in grain 10-21	Yield bu/A
April 20	18	8.7	25,300	6	18.6	195
May 3	10	8.8	24,900	10	19.3	201
May 17	7	9.3	22,300	9	23.2	182
May 29	8	9.5	24,300	13	27.8	164
June 12	6	10.0	23,500	18	41.5	132

1/ Planted two rows on a 40-inch bed.

2/ Plants per acre at harvest. All plots seeded at the rate of 29,300 seeds/acre.

Table 3. Influence of planting date on the performance of Pioneer 33694, Bushland, Texas, 1974. 1/

Date Planted	Days to Emerge	Height Feet	Harvest 2/ Stand	% Lodging 10-15	Grain Yield bu/A
April 24	10	6.4	21,500	18	149
May 10	8	7.2	23,250	26	153
May 21	7	7.9	23,000	34	140
June 6	6	8.5	25,000	30	123

1/ Planted in 30-inch rows.

2/ Plants per acre at harvest. All plots seeded at 32,400 seeds/acre.

Table 4. Normal temperatures and departure of observed temperature from normal for the three spring months of 1972-74, Bushland, Texas.

Month	Normal Mean Temperature °F	Departure from normal, °F		
		1972	1973	1974
March	45.9	+4.1	-0.5	+5.5
April	55.8	+2.0	-7.2	+2.7
May	64.8	-3.3	-3.6	+5.0

Table 5. Yield response of two varieties to row spacing, Bushland, Texas.[1/]

Row Spacing inches	Dekalb XL45 bu/A	Dekalb XL45 Relative	Texas 40 bu/A	Texas 40 Relative
40	97	100	91	100
30	103	106	95	104
20	105	108	99	109

1/ The average of results from three plant populations and three years, 1969-1971.

Table 6. Yield response of two varieties to plant population, Bushland, Texas.[1/]

Plants per acre	Dekalb XL45 bu/A	Texas 40 bu/A
18,000	99	106
24,000	106	92
30,000	105	87

1/ The average of results from four row spacings and three years, 1969-1971.

Table 7. Performance of Pioneer 3369A at three plant populations, Bushland, Texas, 1972. 1/

Plants per acre 2/	% Lodging 9-11-72	Grain Yield bu/A
20,000	1	179
25,000	1	184
30,000	1	188

1/ The average of three dates of planting.
2/ Plots were planted in excess of 40,000 seeds/A and thinned to the desired stand at the 6-8 leaf stage.

Table 8. An estimate of the percent of years when poor stands will result from cold weather if corn is planted on the dates given, Bushland, Texas.

Planting Date	% Years with poor stands 1/
April 1	33
April 10	15
April 20	5
April 30	1

1/ Due either to slow emergence in cold soils or frost injury to seedlings after emergence.

Table 9. A guide to relative seeding rates of corn for the planting dates shown, Bushland, Texas.

Planting Date	Relative Seeding Rate
April 1	115
April 15	105
May 1	100
May 15	95
June 1	90

Irrigated Corn

John Shipley

Corn yield data show wide variability among producers and are not consistent on the same farm from one year to the next. Since corn is a relatively new crop to the area, cultural practices often employed in irrigated corn production reflect the farmer's experience with irrigated grain sorghum. Although research data are available from the Corn Belt Region, High Plains farmers need additional information related to water management and cultural practices pertinent to their soil type and climatic conditions. Water and nutrient requirements of the corn plant vary with stage of growth and physiological activities occurring during specific growth intervals. Environmental factors such as radiation, temperature and wind movement strongly influence plant water requirements. Efficient use of water and fertilizer will depend upon their availability during periods of rapid growth and critical stages of development when plant requirements are greatest.

Whether corn is grown for grain or ensilage, there should be optimum levels of water and nutrients that are correlated with high yields of dry matter. Scheduling irrigations to coincide with high water use periods should result in more efficient use of limited irrigation water.

In an attempt to obtain needed information from which farmers can make economically sound decisions, irrigation research in corn production was initiated at the North Plains Research Field at Etter in 1970. Today, we will review research that has taken place over the past five years.

In 1970, a study was undertaken to investigate the consumptive water use, harvestable dry matter production and nitrogen uptake for irrigated

corn grown on a Sherm silty clay loam (see PR-2898). Soil moisture was maintained near field capacity and nitrate nitrogen averaged 670 pounds per acre in the 0-4 foot soil profile.

(1) Total water use from emergence to grain hardening stage (May 7-September 8) was 24.2 inches. Total water use represents water loss through soil evaporation and plant transpiration, assuming water movement below the 4-foot zone to be negligible. Daily water use averaged .25 inch or more for a period of approximately 35 days (June 20-July 25), wit with a peak of .5 inch per day just prior to tasseling on July 10 (figure 1). Temperature ranged from 92-102°F between July 3 and July 10 and exceeded 100°F on five days during the eight-day period.

(2) Under the experimental conditions, irrigated corn produced a little over six tons of dry matter per acre. Dry matter was about evenly divided between grain and forage. The highest daily production of dry matter averaged 187 and 202 pounds per acre just prior to tassel and about the milk stage, respectively (figure 2).

(3) Total nitrogen uptake averaged 155 pounds per acre. Three peak nitrogen use periods, averaging 2.8, 2.1 and 2.5 pounds per acre per day occurred just prior to tassel, milk and grain hardening stage, respectively (figure 3).

In 1972, tensiometers were used to schedule irrigations on corn grown on a Sherm silty clay loam at the Research Field (see PR-3255). This soil type is comparable to the Pullman Series of the High Plains. Tensiometers were installed at 12 and 18 inches beneath the crest of

the beds. Since the 1970 water use study showed the peak water use period was during the pollination and fertilization phase (June 20 to July 20), the tensiometer study divided the growth cycle of corn into the following three growth periods to evaluate irrigation water use efficiency:

(1) Plant development stage - prior to June 20.

(2) Fruiting stage - June 20 to July 20.

(3) Grain development stage - after July 20.

Irrigations were applied at various soil moisture tensions, ranging from .3 to .7 bar, during these stages (figure 4 & 5). Yields ranged from 138 to 218 bushels of shelled corn per acre, while irrigation water applied ranged from 14.2 to 43.4 inches. When tensiometers were read frequently, the rate of increase in soil moisture tension between irrigations provided data for anticipating the next irrigation several days in advance. Should effective rainfall occur, the tensiometer reflects the drop in soil moisture tension and delays the next irrigation while the crop makes maximum use of natural precipitation. However, the level of soil moisture tension selected for irrigation can create problems on a silty clay loam, especially when tensiometers are placed at the 12-inch depth. The .3-bar level is near field capacity. An attempt to maintain soil water potential at this level requires frequent irrigations; the surface remains wet, the infiltration rate drops near .05 inch/hr and an excessive amount of tailwater occurs during each irrigation. Conversely, in a silty clay loam as soil moisture tension approaches .7-bar at the 12-inch depth, the soil begins to crack, and the tensiometer is in danger of breaking suction. When this occurs the gage may or may not drop to zero. It is not uncommon for the gage to show a drop of

several centibars then regain suction; especially when some precipitation is received about the same time. Once the tensiometer breaks suction, the readings are in error unless the air is removed from the instrument.

Tensiometers offer an objective, relatively inexpensive method of scheduling irrigations, but additional experiments are needed with corn and other crops before making any specific recommendations.

In 1973, a corn irrigation study was designed to evaluate the yield response to water applied at specific growth stages. The growing period of the corn plant was divided into the following four stages where previous research indicated water could be most efficiently utilized:

(1) pre-tassel (approximately 55 days after emergence)

(2) silking and pollen shed (approximately 65 days after emergence)

(3) blister of pre-roasting ear (approximately 80 days after emergence)

(4) milk or soft dough (approximately 95 days after emergence)

During the above stages a four-inch irrigation was applied in all possible combinations of one, two, three and four irrigations, including a pre-plant only irrigation treatment. All plots contained three plant population rates: 14,000, 18,000 and 24,000 plants/acre. All plots received an irrigation on June 5, approximately 35 days after emergence when the growing point was at ground level. The preplant only irrigation treatment produced an average of 18.2 bu/A, with a significant difference in yield in favor of the lowest plant population (table 1).

Under limited irrigation, where only one seasonal irrigation was applied, the tassel-silking irrigation on July 12 resulted in an average yield of 48.3 bu/A or an increase of 30 bu/A over the pre-plant only irrigation treatment. A combination of the tassel and milk irrigation produced the highest yield for two seasonal irrigation, averaging 73.0 bu/A, or an increase of about 25 bu/A over a single irrigation at the tassel stage (table 2). Yield was increased an additional 15 bu/A when three irrigations were applied. When a pre-tassel irrigation was applied in combination with the tassel and milk irrigations, the average yield increased to 88.2 bu/A (table 3). The highest average yield for all four irrigations was 104 bu/A. Where three or more irrigations were applied there were significant yield differences in favor of the higher plant population. The relatively low yields reflect the exceptionally dry summer of 1973. An additional irrigation late in the summer would no doubt have been beneficial yieldwise.

Figure 1. Daily water use curve for Irrigated Corn, North Plains Research Field, Etter, 1970.

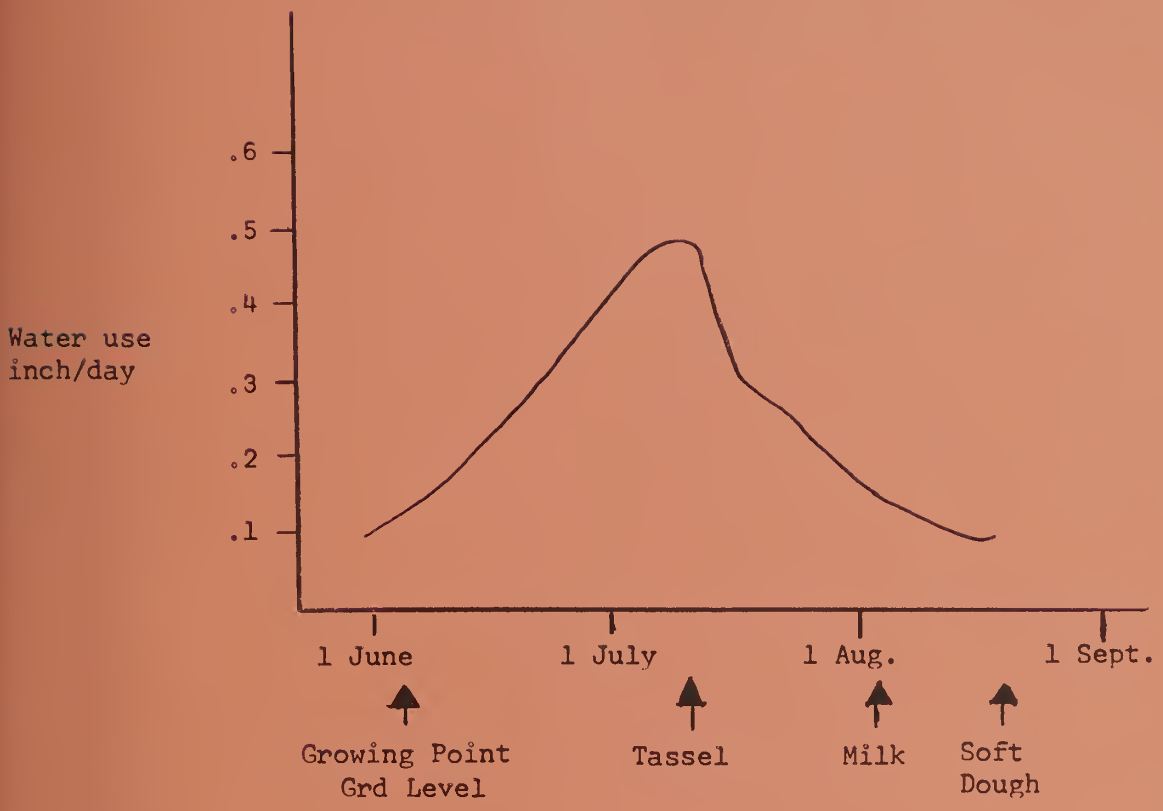


Figure 2. Daily dry matter production curve shown by growth stages for irrigated corn, North Plains Research Field, Etter, 1970.

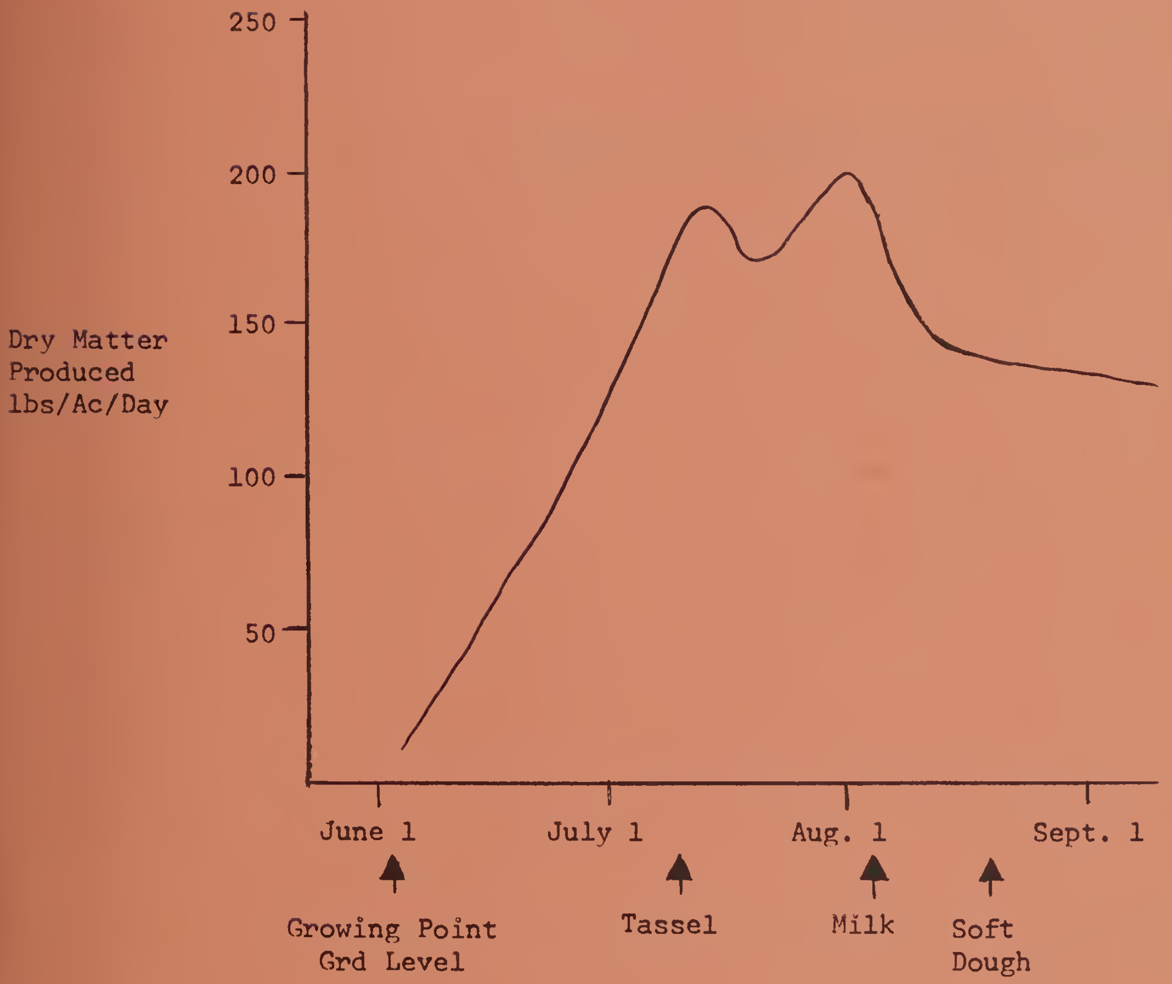
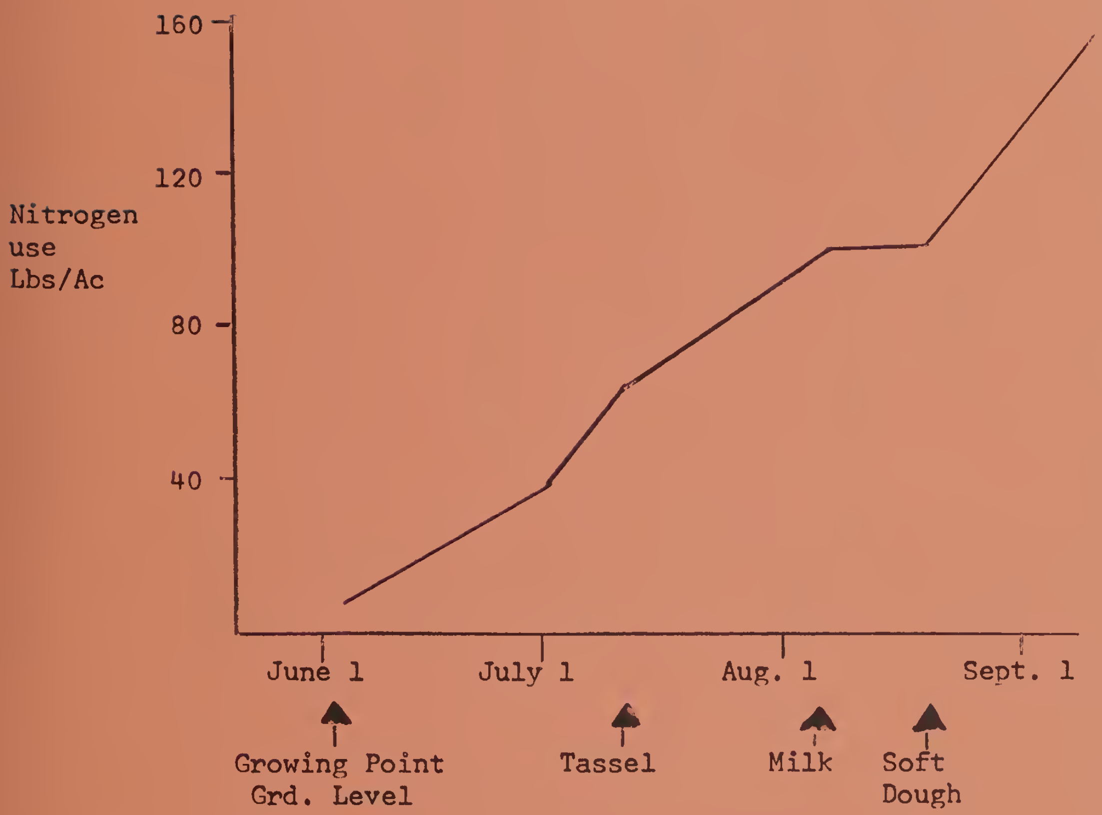
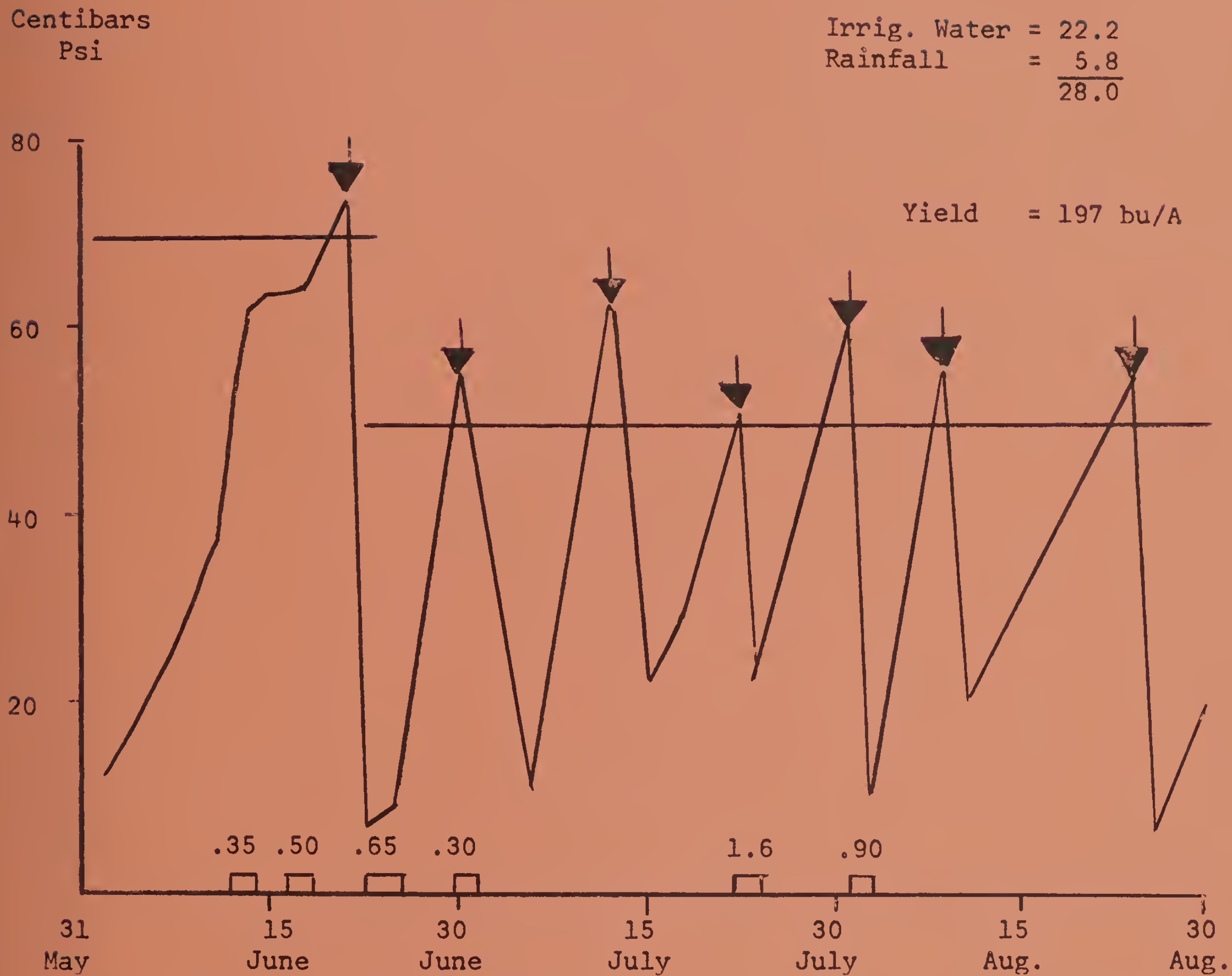


Figure 3. Accumulative Nitrogen use curve by growth stages for irrigated corn, North Plains Research Field, Etter, 1970.



CORN TENSIOMETER STUDY - 1972

Figure 4.



CORN TENSIOMETER STUDY - 1972

Figure 5.

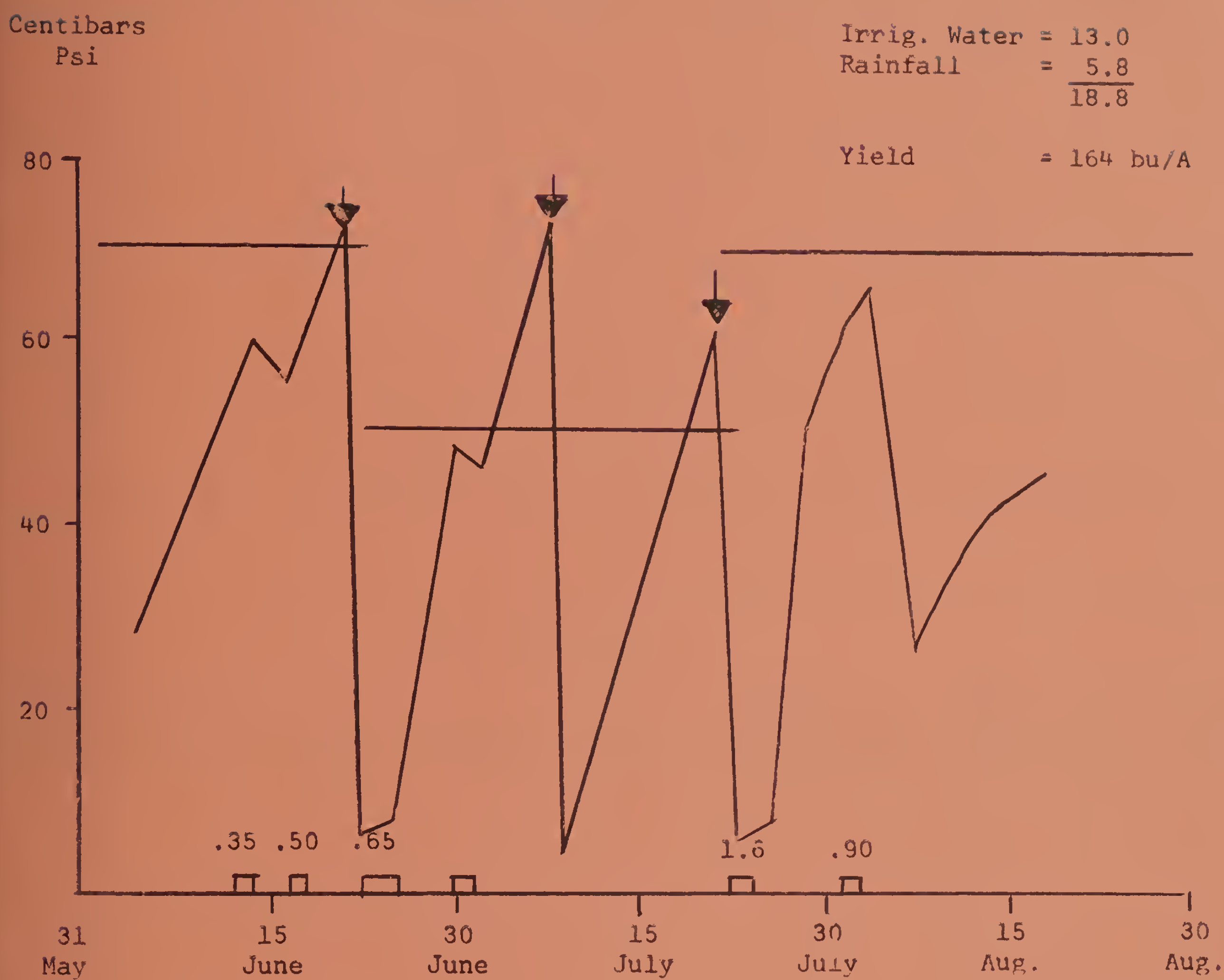


Table 1. Yield, Plant Population and Irrigation data for Corn Water Response Study, North Plains Research Field, Etter, 1973.

Emergence + 35 days (6/5)	1-4" Irrigation: Pre-Tassel (6/27)	Tassel (7/12)	Blister (7/26)	Milk-Soft Dough (8/7)	Seasonal Irrig. water (inches)	Plant Population/Acre 14,000	18,000	24,000
						Bu/Ac-Shell Corn-14%		
X					4	22.8	16.7	15.2
X	X				8	34.0	38.9	24.9
X		X			8	48.2	49.8	46.2
X			X		8	39.3	39.2	30.8
X				X	8	24.7	23.3	15.2

Table 2. Yield, Plant Population and Irrigation data for Corn Water Response Study, North Plains Research Field, Etter, 1973.

Emergence + 35 days (6/5)	2-4" Irrigations: Pre Tassel (6/27)	Tassel (7/12)	Blister (7/26)	Milk-Soft Dough (8/7)	Seasonal Irrig. water (inches)	Plant Population/Acre 14,000	18,000	24,000
						Bu/Ac-Shell Corn-14%		
X	X	X			12	61.7	72.2	63.3
X	X		X		12	53.2	53.9	45.5
X	X			X	12	61.7	59.6	55.7
X		X	X		12	61.8	62.8	55.4
X		X		X	12	66.9	76.1	76.1
X			X	X	12	42.9	40.8	43.9

Table 3. Yield, Plant Population and Irrigation data for Corn Water Response Study, North Plains Research Field, Etter, 1973.

Emergence + 35 days (6/5)	Pre-Tassel (6/27)	Tassel (7/12)	Blister (7/26)	Milk-Soft Dough (8/7)	Seasonal Irrig. water (inches)	Plant Population/Acre 14,000	18,000	24,000
						Bu/Ac-Shell Corn-14%		
			3-4" Irrigations					
X	X	X	X		16	77.6	71.1	74.7
X	X	X		X	16	78.3	87.5	98.9
X	X		X	X	16	63.7	61.4	51.4
X		X	X	X	16	76.6	78.3	80.7
			4-4" Irrigations					
X	X	X	X	X	20	91.1	95.7	104.0

Weeding Corn

Allen F. Wiese

Herbicides available for controlling weeds in corn are listed in Table 1. Most corn herbicides easily control pigweed but not watergrass. Consequently, a series of studies were started in 1971 to develop practical control methods for this weed. In 1971 and 1972, studies were located on Harvey Garrison's farm, 10 miles east of Dumas. The furrow irrigated farm leased in 1970 was severely infested with watergrass. Garrison preirrigated his corn fields and irrigated 4 or 5 times during the season. In 1971, preplant herbicides were applied on April 7 and corn was planted on May 1. In 1972, after some leveling was done on the field, preplant herbicides were applied about May 1 and corn was planted on June 5. Preplant herbicides were applied to beds and incorporated with two passes of a rolling cultivator. Preemergence treatments were applied a day or two after planting, with postemergence directed sprays made during the second month after corn emergence when watergrass was 4 to 6 inches tall. Fields were cultivated twice before corn was 2 feet tall.

The best control in 1971 was obtained when a total of 5 pounds of AAtrex was applied. It didn't matter if the herbicide was applied preplant, preemergence or split into two applications. In 1972, results were a little different, and watergrass control was increased 10 percent with a split application. Postemergence directed applications of AAtrex and Evik did not enhance weed control. Soil was dry and the large watergrass under moisture stress was hard to kill.

In 1973, the study was moved to the Texas Tech Center at Amarillo because Garrison had controlled most of the watergrass in his fields. Treatments were redesigned and several short residual herbicides were included. If short residual herbicides controlled watergrass, it would be possible to plant winter wheat immediately after harvest. Preplant herbicides were applied May 10 and corn was not planted until June 22, after a late preplant irrigation. Dry weather prevented watergrass emergence until 5 weeks after planting. Because corn was already 3 feet tall, weeds were not cultivated. As in previous years, AAtrex applied at 3.75 to 5 pounds per acre preplant, preemergence or as a split application gave the best watergrass control. If less herbicide was applied, weed control was reduced. Contrary to previous years, postemergence directed sprays gave excellent control. Three-inch watergrass growing in wet soil in 1973 was much easier to kill than larger grass growing in dry soil in 1971 and 1972. For example, control with Lasso used preemergence at 2.5 quarts per acre was about 35 percent. Postemergence application of Lorox or Evik increased grass control to 75 percent. Uncontrolled weeds reduced corn yield where Lasso was used alone, but yields were normal where a postemergent spray followed Lasso.

In 1974, outstanding watergrass control was obtained where either Sutan[+] and Eradicane was applied at 4.75 pints per acre and incorporated with a tandem disk prior to bedding. Application, incorporation and bedding were done 3 days before planting and corn was "watered up" with furrow irrigation. Watergrass control was not as good in a previous study, when Sutan had been incorporated with a

tandem disk 40 days before planting. After incorporation, the field was bedded and prewatered in preparation for planting. Applying these two herbicides immediately before planting and "watering up" seems to be the best procedure.

Herbicide treatments did not affect yields in 1971, but increased yields about 40 percent in 1972 and 1973. In 1971, corn planted the first of May had some watergrass in untreated checks at harvest, but yields were not reduced. Watergrass that emerged in late May after corn was established was not very competitive. Corn planted in early June, 1972, did not have this advantage because weeds emerged at the same time. An inch of rain 4 days after planting germinated a good crop of grass. The weedy check yielded 90 bushels and the highest yielding treatment made 150 bushels per acre. All herbicide treatments that gave good weed control yielded in excess of 130 bushels per acre. Corn yields varied from 34 bushels per acre on untreated areas to 61 bushels per acre on the highest yielding treatment in 1973. Other treatments yielded from 49 to 58 bushels per acre. Over 3000 pounds per acre of watergrass grew on untreated acreas, while most herbicide treatments held weed growth to less than 300 pounds per acre.

SUMMARY

Several good herbicides are available for controlling pigweed in corn. If watergrass is a problem, corn is a good crop to grow. Planting corn before May 1, applying a preplant incorporated application of AAtrex at 3.75 to 5 pounds per acre and two cultivations resulted in top yields and excellent watergrass control. Good control was obtained when Sutan+

and Eradicane were incorporated with a disk immediatelv prior to bedding and corn was "watered up" after planting on dry beds. Preemergence applications of Lasso and Bladex followed by post directed sprays of Evik or Lorox gave adequate control and near maximum yields. If annual crops other than sorghum are to be rotated with corn, AAtrex must not be used.

Table 1. Corn Herbicides a/

	Control b/			Unit	Product rate/A for soil type c/					Soil d/ residual
	Wild sorghum	Water-grass	Broad-leaf		Sandy	Loamy sand	Sandy loam	Loam	Clay loam	
Preplant										
AAtrex 80W	P	G	G	(lb)	2.5	2.5	2.5	3	4	long
AAtrex 4L	P	G	G	(pt)	4	4	4	4	6	long
Eradicane	E	E	G	(pt)	4.75	4.75	4.75	4.75	4.75	short
Sutan+ with AAtrex 80W	E	E	G	(pt) (lb)	3.75 1	3.75 1	4.75 1	4.75 1	4.75 1	medium
Preemergence										
AAtrex 80W	P	G	E	(lb)	2.5	2.5	2.5	3	4	long
AAtrex 4L	P	G	E	(pt)	4	4	4	4	6	long
Bladex	P	F	G	(lb)	No	No	1.5	2.5	3	short
Lasso	F	F	G	(pt)	4	4	4	0.5	6	short
Lorox	to be mixed with Lasso or AAtrex									
Postemergence										
AAtrex 80W	P	F	E	(lb)	2.5					long
Banvel	No	No	G	(pt)	0.25 to 0.5					short
Evik	No	F	G	(lb)	2.5					short
Lorox	No	F	G	(lb)	1.25 to 3					short

a/ Many of the herbicides listed can be applied with others as a tank mix (see labels).

b/ E = Excellent; G = Good; F = Fair; No = None.

c/ Use less herbicide for band treatments.

d/ Observe label for cropping restrictions on long and medium residual herbicides; short, residues will be gone before next season; medium may be gone by next season; long will be present next season.

Southwestern Corn Borer and Banks Grass Mite

Norris E. Daniels

Pesticidal experiments were conducted at Bushland and Spearman for control of the Southwestern corn borer and Banks grass mite. Two foliar spray treatments each of azodrin and carbofuran effectively controlled the corn borer, Tables 1 & 2. The Banks grass mite was controlled with foliar treatments of parathion, disulfoton, carbofuran, azodrin, and meta systox R, Table 3. Grain yields were increased at Spearman.

Borer infestation was not affected by different corn planting dates. However, lodging was greater in late planted corn, Table 4. There were no corn borer diapause larvae in corn stubble of disk or chisel tilled land but an infestation persisted in the stubble of nontilled or layout land, Table 5. Diapausing larvae that were moved into the greenhouse pupated in April and May the same time as those in the field, Table 6. Spring adults emerged from the middle of May into June.

Table 1. Southwestern corn borer and Banks grass mite seasonal reduction and grain yields following pesticidal spray treatments of corn, Bushland, 1974.

Treatments at 1 lb./A	Percentage reduction of corn borer	Percentage reduction of Banks grass mite	Grain yields Bu/A 8/
1 application 1/			
Carbofuran	17	51	109 a
Azodrin	0	78	112 a
1 application 2/			
Carbofuran	34	69	110 a
Azodrin	11	79	111 a
1 application 3/			
Carbofuran	31	76	105 a
Azodrin	17	85	109 a
2 applications 4/			
Carbofuran	80	85	114 a
Azodrin	80	87	115 a
3 applications 5/			
Carbofuran	70	87	112 a
Azodrin	41	87	111 a
Untreated	70 6/	5000 7/	110 a

Application dates: 1/ 6/27; 2/ 7/9; 3/ 7/25; 4/ 7/9 and 7/25; 5/ 6/25, 7/9, and 7/25.

6/ percentage infestation (30 percent of plants not infested)

7/ mites per plant

8/ Mean values followed by the same letter not significantly different at the .05 level.

Table 2. Southwestern corn borer, corn earworm, and Banks grass mite seasonal reduction and grain yields following pesticidal spray treatments of corn, Spearman, 1974.

Treatments at 1 lb./A	Percentage reduction of: corn borer	corn earworm	Banks grass mite	Grain yields bu/A 7/
1 application 1/				
Carbofuran	85	0	25	114 bcd
Azodrin	85	0	55	114 bcd
1 application 2/				
Carbofuran	80	12	30	105 d
Azodrin	93	0	63	118 abc
2 applications 3/				
Carbofuran	93	3	29	124 ab
Azodrin	93	12	73	121 abc
3 applications 4/				
Carbofuran	96	7	36	126 a
Azodrin	98	29	81	126 a
Untreated	46 5/	30 5/	5000 6/	111 cd

Application dates: 1/ 7/3; 2/ 7/16; 3/ 7/16 and 7/30; 4/ 7/3, 7/16, and 7/30.

5/ percentage infestation (54 and 70 percent of plants not infested)

6/ mites per plant

7/ Mean values followed by the same letter not significantly different at the .05 level.

Table 3. Banks grass mites per plant and percentage reduction following acaricidal spray treatments of seedling corn, Bushland, 1974.

Treatments 1/ at .5 lb./A	Days after application 2/							Percent reduction after	
	1	7	15	22	29	36	40	29 days	40 days
Parathion	0	0	1	0	50	300	100	85	62
Disulfoton	1	0	1	2	60	250	225	81	54
Supracide	1	0	0	5	200	150	100	40	61
Kelthane	2	1	1	10	100	400	250	67	35
Meta Systox R	0	0	1	0	100	200	125	70	64
Carbofuran	1	0	0	4	30	150	125	90	74
Azodrin	0	0	0	2	70	300	350	79	39
Untreated	125	3	6	10	200	400	430		

1/ Applied 5-12 in 12 gal. H_2O per acre; corn 4 inches tall.

2/ Two and one half inches of rain was received 3 days after application and another .5 inch 12 days after; therefore mite populations remained low for a least 22 days after treatment.

Table 4. Southwestern corn borer infestation, plant lodging and grain yields of corn planted on dates indicated, Bushland, 1974.

Date of planting	Percentage infestation	Percent lodging	Grain yields bu/A
4-24	68	18	137
5-10	71	25	140
5-22	71	34	128
6-6	69	29	118

Table 5. Southwestern corn borer, percentage larval infestation in the corn stubble of different tillage practices on dates indicated, Spearman, 1974.

Date	Type of tillage		
	None	Disk 1/	Chisel 2/
2-13	55 3/	32 4/	27 4/
3-29	43 5/	0	0

Month of tillage: 1/ November 1973

2/ December 1973

3/ 53 percent live larvae (no-till field 1/2 mile north of tilled fields)

4/ 100 percent dead larvae

5/ 80 percent live larvae

Table 6. Dates on which Southwestern corn borer infested corn crowns were brought from Spearman to the greenhouse at Bushland, of pupation, adult emergence, of adult mortality, and number of eggs laid, 1974.

Entry No.	Dates: brought to greenhouse	of pupation	of adult emergence	of adult death	Number of eggs laid
larvae					
1	2-20	5-1	5-14	5-17	230
2		5-5	5-19	5-25	0
3		5-3	5-16	5-21	21
4		5-6	5-19	5-20	0
1	3-29	4-26	5-8	5-10	0
2		5-9	5-21	5-24	200
3		5-16 1/			
4		5-19	6-1	6-6	140
pupae					
1	5-27		6-1	6-4	23
2			6-5	6-8	0
3 1/					
4			6-4	6-7	0

1/ Did not develop to adult (died during pupation).

CORN INSECT PROBLEMS - MANAGEMENT AND CONTROL

Bill Clymer

In some geographical areas a variety of crops are grown. Where this occurs, there is more interaction of insects from one crop to another. However, in an area such as the High Plains where extremely large acreages of only a few crops are grown, this is not always true. When there is a tremendous increase in acreage of a particular crop, it may remain relatively insect free for a few years. After this initial period of limited problems, a gradual increase often occurs. Based on previous records, this occurred to corn production on the High Plains several years ago and history is apparently repeating itself.

Soil Insects

Numerous "soil" pests occasionally occur but seldom cause large economic losses in the High Plains area. These include: white grubs, wireworms, corn rootworms, cutworms, seed corn beetles and seed corn maggots. White grubs are frequently found on soil high in organic matter but have been more of a problem in the South Plains. Wireworms are most common on soil that was in sod the previous season. Several species of cutworms occasionally cause some stand loss. Their occurrence seems to be dependent on climatic conditions and are not as easy to predict as some of the other pests. Seed corn beetles and seed corn maggots seldom are of major concern on the High Plains.

Of the "soil pests", the corn rootworm causes the most concern in the mid-western corn states. At the present time economic damage in the Texas Panhandle has been reported from only isolated areas. These include the Texline area and a few fields north of Spearman. Northern, western and southern corn rootworm adults have been observed but the western corn rootworm appears to be the most damaging in Texas. The southern corn rootworm adult is also known as the 12-spotted cucumber beetle. Should these corn pests become better established, large economic losses could occur.

Control of the "soil pests" is difficult and often expensive. Cultural practices are of utmost importance since soil pests often build under continuous cropping of the same or similar plant species. Keeping fields weed-free is very important. Once the crop has been planted, there are generally no effective methods of achieving control. Producers should sample their fields before bed formation to determine the presence of soil insects. The decision for chemical control should be made only if sufficient insects are present or if past history indicates the need.

Two possible alternatives exist for chemical control. The seed may be treated or the material may be applied to the soil. If soil treatment is used, it may be put on preplant broadcast, row band or at planting-time in-furrow. Regardless of the method, the producer should carefully read and follow label directions. For more information on control, please refer to Texas Agricultural Extension Service publication, MP339, Suggestions for Controlling Insects and Mites on Corn, Sorghum, and Small Grains.

Early Season Pests

Numerous pests may be observed as causing damage to corn prior to tasseling. Most of them are foliage feeders and seldom does any major economic damage occur. Thrips have been observed as moving from wheat to small corn in large numbers. It is doubtful that any real danger exists from this pest. Occasionally, Banks grass mites have been blown from wheat to adjacent corn fields. During the 1974 crop season, much concern existed from this problem. Chemical controls were applied in some areas but poor control was generally the result. The mites did not continue to develop on the small corn, and in most cases, no advantages were gained from attempted control.

Flea beetles frequently can be found in heavy numbers in corn fields but control is seldom needed. Clean cultivation and weed control along borders will often help to alleviate this as well as other pests. The corn earworm, as well as other lepidotera (moth and butterfly) larvae, is frequently found feeding within the whorl of the plant. This causes a condition commonly known as ragging. Research data has shown that little economic loss occurs from this feeding and that effective control is difficult to obtain.

First generation southwestern corn borer larvae may be observed on small corn. If corn stubble has been left in an adjoining field from the previous year, heavy populations may occur. The early season borer feeding may kill the growing tip and cause a condition known as "dead heart". First generation larvae normally are not present in sufficient numbers to cause much damage and control is difficult. The emergence period for the overwintering moths is spread over a several week interval. For this reason egg laying and, consequently, egg hatch occurs over a long period of time. Attempts at control would reduce beneficial populations and possibly release other problems such as the Banks grass mite.

Numerous aphids may be found infesting area corn but economic problems seldom exist. The corn leaf aphid is a major pest in some states and has been reported as causing losses as high as 40 percent in Indiana. However, no known economic losses caused by the corn leaf aphid have occurred in Texas.

Late Season Pests

Numerous insects are frequently found attacking corn during and after the tassel stage of growth. Corn leaf aphids continue to be present and numerous foliage feeders, including fall armyworms and grasshoppers, may cause concern. The corn earworm, southwestern corn borer and the Banks grass mite also make their presence known.

Corn earworm moths are generally active during the silking stage and may deposit their eggs on the leaves, tassel or silks. The newly hatched larvae begin feeding almost immediately. If the eggs are laid on the silks, the small larvae retreat into the shuck where larval development occurs. Chemical control of the corn earworm is not recommended for several reasons. The larvae are cannibalistic and only seldom will more than one larvae per ear be found. Most of the damage occurs to the tip of the ear and only 12-15 full sized kernels will normally be damaged. After the larvae enter the shuck, chemical control is not effective and a chemical application at this time may trigger a Banks grass mite outbreak. Numerous beneficials are also present which help to keep corn earworm populations at a lower level.

Southwestern Corn Borer

At the present time, the southwestern corn borer appears to be one of the most potentially damaging pests the corn producer has to face. It was first found in the United States in 1913 and has since spread to most of the southern corn producing states. For a number of years, the heaviest concentrations in Texas occurred in the Bailey, Parmer and Castro County areas. However, during the last three years damaging populations have been observed throughout the Panhandle.

Feeding Habits and Injury to the Plants

The southwestern corn borer has a host preference for corn but also attacks several other plants including sudan grass, grain sorghum, Johnsongrass, sugarcane, broomcorn and the cocklebur. The borer has not been a problem in area grain sorghum but has occasionally been found infesting that crop. However, Arizona has not been so lucky. Research reports indicate that since 1967, losses in Arizona grain sorghum have run as high as 50% from the southwestern corn borer. Much work is presently being conducted to combat the borer in the

southern half of Arizona where grain sorghum infestations are the most severe.

The size of the grain sorghum stalk makes it more susceptible to lodging and due to the "shape" of the plant, the heads frequently break off and fall to the ground. This makes mechanical harvest impossible.

Research reports from Mississippi indicate that on whorl-stage corn, most of the corn borer larvae move from the site of hatch to the inner whorl where they feed for about 10 days on immature leaves. The larvae then normally leave the whorl and move down the stalk, bore into the stalk and start tunneling. On tassel-stage corn, most newly hatched larvae move into the middle (ear) zone of the corn plant and may feed for several days between the husk layers of the primary ears and ear shoots. Later they appear to feed on the kernels, cob, and shank of the ear. Their movement from the primary ears and ear shoots to the stalk occurs generally between 15 and 20 days after egg hatch.

The whorl feeding damage appears as small glazed areas and as the larval feeding continues, holes are cut through the leaves. As the leaves emerge from the whorl, rows of holes may be present. This type of damage is normally caused by the first generation for that season, and little economic damage is thought to occur from early feeding.

Sooner or later, the southwestern corn borer larvae enter the stalk and start tunneling up and down. Several may tunnel in one stalk, although normally, one larvae is all that is found in the fall. Several entrance and exit holes may be present where the larvae have left and reentered the stalk. These entrance and exit holes may be a source of infection from one of the rot organisms, and the tunneling may weaken the stalk. However, data indicate that little grain loss occurs from the borer feeding but most often is due to the plant lodging or falling down.

As the season progresses, larval mortality is generally quite high. The remaining larvae gradually migrate down the stalk, and in the fall for some unknown reason, girdle the plant just above ground level. During the girdling process, all the stalk in a narrow zone is consumed except the outer layers of cells. After this is accomplished, the larvae tunnel into the stub of the stalk where they spend the winter.

Description of the Southwestern Corn Borer

The eggs are elliptical to oval, flattened, slightly convex on the upper surface, and translucent white when first laid. They are quite small and average 1.2 to 1.6 mm. in length by 0.8 to 1 mm. in width. One apparent characteristic of the borer is its habit of laying eggs in chains or groups that overlap much like fish scales or shingles on a roof. Eggs may be found in groups of two to fifty or more but generally average four to eight per group. Another characteristic of the eggs is their color and appearance change as the incubation period continues. Three parallel rows of reddish-orange lines appear prior to hatching, and the color of the eggs changes to yellow, orange-yellow, or reddish-brown before hatching.

After the eggs hatch, the small larvae very closely resemble the full grown "worm" which is from one to one and one-fourth inches long and dull white or yellowish-white in color. The larvae also have a regular pattern of dark brown polka dots which generally disappears in the overwintering form which is a creamy yellow color.

The pupae are slightly shorter than the larvae and mahogany brown in color. They are normally found within the stalk during the summer and in the stub of the stalk in the spring.

The moths are from three-fifths to three-fourths inch long with a wing

spread of one and one-fourth inches. They are solid white to pale yellow and, when at rest, fold the wings about the body.

Life Cycle

The southwestern corn borer overwinters as a full grown larvae and usually hibernates at or near the base of the crown. The upper part of the tunnel is closed with a tough silken plug for protection. In the spring, the borers extend their tunnels to the outer wall of the stem, leaving a thin covering that the moth can easily push aside. Pupation then follows with the moth soon emerging from the plant crown. Mating occurs within a couple of days, and eggs are glued to the plant, usually on the top side of a leaf about one-half way up the stalk. The eggs hatch within a few days, depending on the temperature.

Developmental Periods

Stage	Average No. of Days
Egg	5
Larvae	25
Pupae	10
Adult	5

Control

Cultural practices play a very important role in managing the southwestern corn borer. Area wide fall or winter stalk destruction through practices such as double disking, chiseling and deep breaking destroy the plant crown, thereby increasing overwintering larval mortality. If the stalks are grazed out, some type of cultivation is still necessary and the earlier this is done in the winter, the more adverse effect it will have on overwintering borer populations. If no cultivation is applied until after the severe part of the winter is over, deep breaking may prove to be the best practice. This turns the crown down under

several inches of soil and makes it difficult for the adult moth to emerge.

Research and observational data indicate that early planted corn is less susceptible to plant lodging caused by the corn borer. A reasonable plant population to insure large healthy stalks along with proper fertilization and adequate irrigation will aid in the prevention of lodging of borer infested stalks. Crops rotation, the use of early maturing varieties, and early harvest with equipment designed to pick up lodged stalks aid both in reducing yield losses and cultural management of the pest.

Several beneficial insects, including both predators and parasites, apparently play an important part in southwestern corn borer suppression. Some of the more prevalent include both the larval and adult stages of the lady beetle, larvae of the green and brown lacewing, the flower bug, several members of the assassin bug group, and a large number of spiders. Little information is available on the various parasites that are important although one of the Trichogramma wasps does attach corn borer eggs. Diperous "scavenger" larvae have been frequently found in conjuction with overwintering corn borer larvae. In areas such as Mississippi and Arkansas, several birds are also important predators, especially the yellow breasted flicker.

Much data have been collected over the past several years in chemical control of the southwestern corn borer. Test conducted in the Texas Panhandle for borer control have generally given sporadic results. Timing of insecticidal applications is extremely critical, since little control will be obtained after the borer has entered the plant. Calendar spray programs generally prove to be expensive with only a fair chance for an economic return greater than the cost of treatment.

It is true that in some instances lodging may have been reduced through chemical treatment, but several other factors need to be considered; primarily,

how many net dollars will be obtained by treating. Other factors to be considered include the result of treatments on secondary pests in corn, such as the Banks grass mite.

Often insecticidal applications will destroy beneficial insects that keep other pests under control.

The Banks grass mite has apparently developed resistance to some pesticides in various areas. At the present time only isolated areas of the High Plains are experiencing resistance, but in the Trans-Pecos area of Texas, mite populations have almost completely wiped out corn and grain sorghum production. This is a serious problem which could extend itself over this vast grain producing area. With this in mind we need to be very aware of the type of problems which could arise from large scale spraying over wide areas. Many researchers feel that part of our mite problems have been brought about by the large amount of spraying for the greenbug in grain sorghum. This surely has had some bearing on the problem.

Banks Grass Mite

The Banks grass mite was first reported from the Texas Panhandle in 1954 on wheat and grain sorghum. However, serious damage to corn was first observed in 1967. Since that time frequent outbreaks have occurred on both grain sorghum and corn. Although mites are observed earlier in the growing season, population increases generally occur following the tassel stage of plant growth. Initial infestations appear on the lower leaves. However, the lower leaves may be killed when populations become exceedingly heavy, and mites often will move up the plant.

Description and Life Cycle

Eggs are laid on the leaf or in webbing which the mites produce. The eggs are spherical and about 1/4 the size of the adult which is about half the size

of a period in ordinary newsprint. They are pearly white when first laid but gradually change to a straw yellow. The eggs hatch in three to four days under optimum conditions but several weeks may be required when cool moist conditions exist.

The small six-legged larvae are light colored when first hatched, but become progressively dark green as they feed. After several days they molt (shed outer skin) to the nymphal stage and feeding continues. After two additional molts, the mites emerge as adults. The males are smaller than the females. Mating occurs soon after the females emerge. Males and females both mate more than once. The females lay an average of one egg per day for approximately 48 days although egg laying may be as long as 80 days. Minimum developmental time from egg to adult is 8 to 10 days with hot, dry climatic conditions appearing to be the most favorable. Although these mites attack corn and sorghum they are found on small grains and numerous grasses. Wheat is the primary overwintering host in the Texas Panhandle.

Control

Numerous beneficial insects appear to feed on both the mites and the mite eggs. Complete dependence on beneficials for control is not a sound practice but under favorable conditions they can greatly reduce mite populations. The most commonly observed predators include predacious thrips, predacious mites, lady beetles (larvae and adults), lacewing larvae, and orius or flower bugs. Weather is the most effective control. Hard driving rains or a period of cool wet weather will greatly reduce mite populations.

The use of pesticides for corn borer control may greatly reduce beneficial populations and "release" damaging mite populations. If damaging populations of the Banks grass mite do occur, chemical control may be necessary. The exact economic thresholds for mite damage have not been established. Apparent

resistance has been demonstrated in some areas. For more information of chemical control, please refer to Texas Agricultural Extension Service publication, MP339.

Summary

Pesticide applications, when they are needed to prevent economic losses to a crop, are a must. However, every effort should be made to use all available means to <u>manage</u> crop pests and not rely solely on chemical treatment. Area wide programs which include many of the cultural and biological factors, coupled with a sound chemical control program, will help keep insect and mite damage below economic thresholds and create a "better" environment.